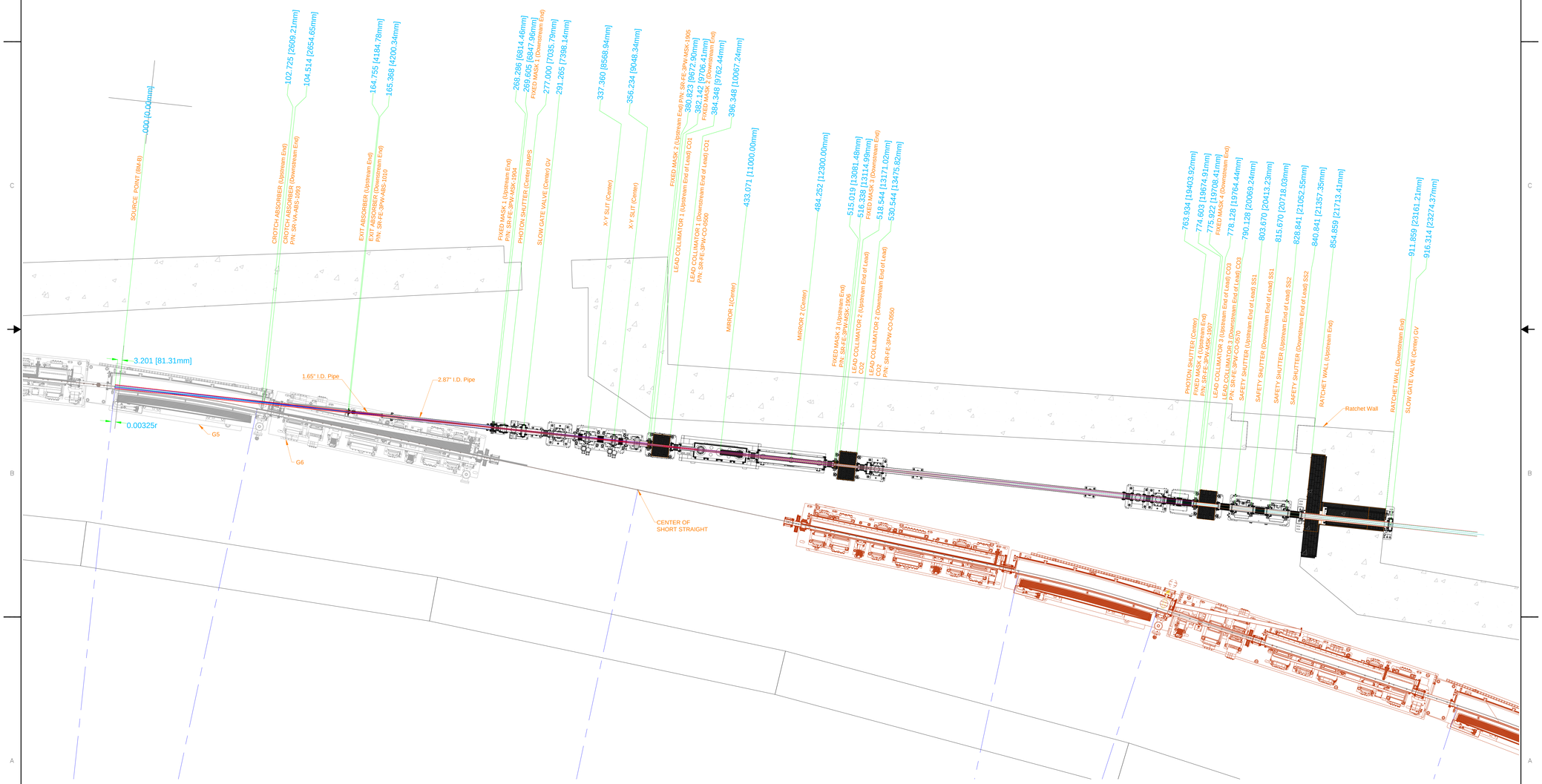
REVISION HISTORY					
REV	DESCRIPTION	DATE	DESIGNER	CHECKED BY	ENGINEER
A	RELEASE PER ECO-002882	1/2015	J.TUOZZOLO	C.AMARITO	A.HUSSAIN
B	REVISED PER ECO-003311	1/2016	M.JOHANSON	J.FABIJANIC	F.DEPAOLA
C	REVISED PER ECO-004120	4/2016	R.GAMBELLA	C.STELMACH	F.DEPAOLA



PLAN VIEW
SCALE: 1:25

TES, CELL 8-BM-B, COMPONENT LAYOUT

HATCH LEGEND
Lead
Concrete or Stainless Steel
Lead (SS)

UNLESS OTHERWISE SPECIFIED
ALL MATERIAL MUST BE IN INCHES
DIMENSIONS IN BRACKETS (IF ARE PRESENT) ARE MILLIMETERS AND ARE FOR REFERENCE ONLY
INTERPRET DRAWING AS PER ANSI Y14.5-1994 OR Y32.3-1975

DIMENSIONAL TOLERANCES:
X ± 0.060
.X ± 0.030
.XX ± 0.015
.XXX ± 0.005

ANGULAR TOLERANCE: ± 5°

FINISH: 125

BREAK EDGES & SHARP CORNERS 0.005 MIN. TO 0.030 MAX.

BROOKHAVEN NATIONAL LABORATORY
BROOKHAVEN SCIENCE ASSOCIATES
UPTON, NEW YORK
Exploring Life's Mysteries
Protecting its Future

NSLS-II
NATIONAL SYNCHROTRON LIGHT SOURCE II

DRAWN BY	J TUOZZOLO	1/2015
CHECKED BY	C AMARITO	1/2015
VACUUM APPROVAL	C HETZEL	1/2015
ESH&Q APPROVAL	A HUSSAIN	1/2015
SUPERVISOR APPROVAL	S.SHARMA	1/2015
ESH&H APPROVAL	A ACKERMAN	1/2015
QA APPROVAL	J HAWKES	1/2015

STORAGE RING
FRONT END, CELL 8-BM-B, TES
RAY TRACING

NEXT ASSY: N/A
PROJECT: NSLS-II
THIRD ANGLE PROJECTION
SCALE: SEE DWG VIEW
WBS# 6.09.05.01
SHEET SIZE: E
DRAWING/PART NUMBER: SR-FE-3PW-5001
REVISION: C
ESH&Q RISK LEVEL: A-1
SHEET 1 OF 7

RELEASED – EFFECTIVE

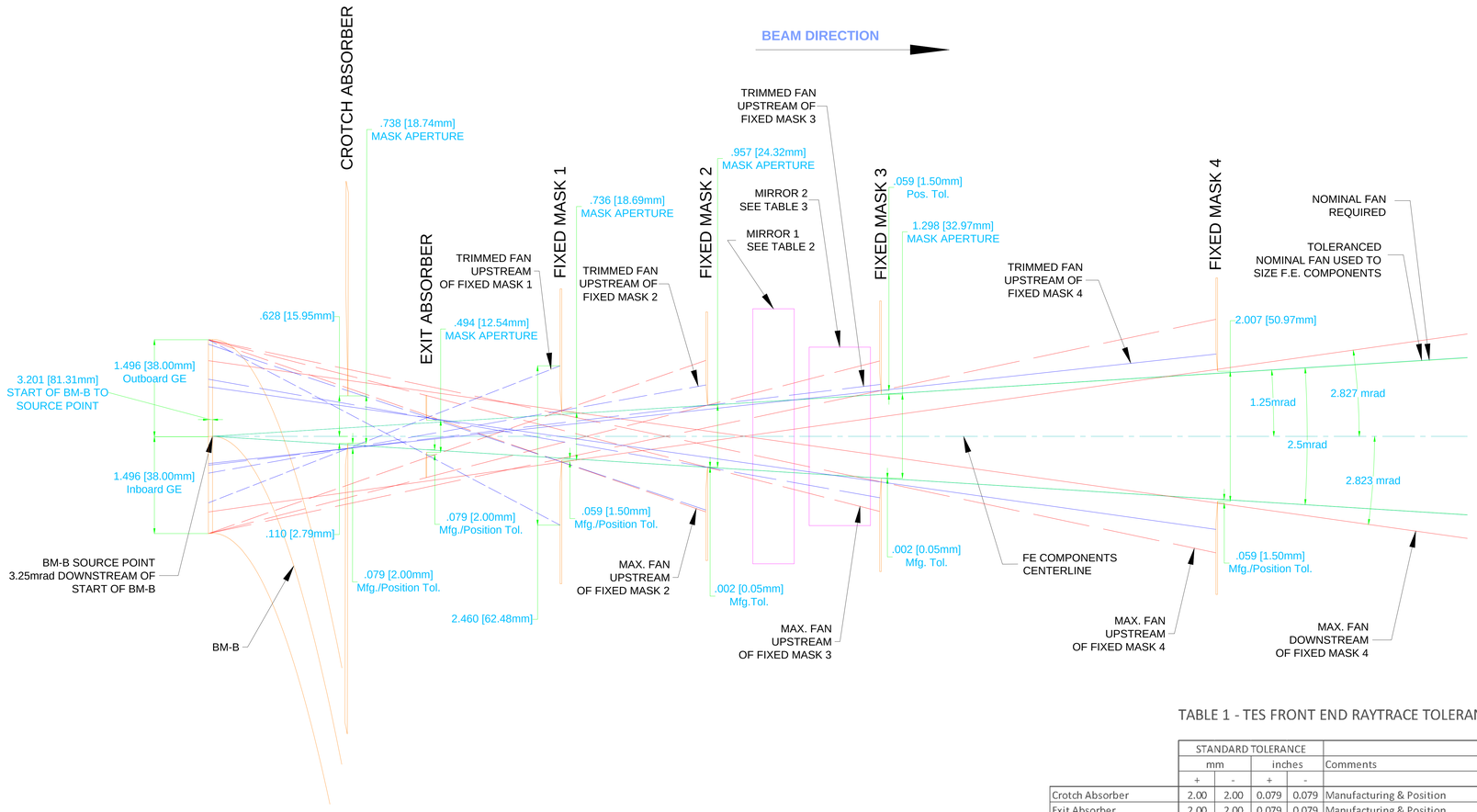


TABLE 1 - TES FRONT END RAYTRACE TOLERANCES

	STANDARD TOLERANCE				
	mm		inches		Comments
	+	-	+	-	
Crotch Absorber	2.00	2.00	0.079	0.079	Manufacturing & Position
Exit Absorber	2.00	2.00	0.079	0.079	Manufacturing & Position
FM at LC01 (FM2)	0.05	0.05	0.002	0.002	Manufacturing Only (Beam Defining)
FM3 aperture	0.05	0.05	0.002	0.002	Manufacturing Only
FM3 max fan	3.00	0.00	0.118	0.000	Manufacturing & Position
FM (FM1 & FM4)	1.50	1.50	0.059	0.059	Manufacturing & Position
LCO tube	0.50	0.50	0.020	0.020	Manufacturing & Position
LCO2 tube Horizontal	1.50	1.50	0.059	0.059	Manufacturing & Position (Sized off of Tol. Nominal fan)
LCO2 tube Vertical	0.50	0.50	0.020	0.020	Manufacturing & Position (Sized off of Tol. Nominal fan)
Collimator lead Horizontal	1.50	0.00	0.059	0.000	Manufacturing & Assembly
Collimator lead Vertical	2.50	0.00	0.098	0.000	Manufacturing, Assembly, Heater tape & Heater Tape Clearance
Shadow Shield	3.00	3.00	0.118	0.118	Manufacturing & Position
RCO upstream lead horiz.	7.85	0.00	0.309	0.000	Clearance, Mfg. & Position
RCO upstream lead vert.	8.85	0.00	0.348	0.000	Clearance, Mfg. & Position
RCO downstream lead	3.00	0.00	0.118	0.000	Manufacturing & Position
RCO tube (minimum)	4.00	-	0.157	-	Manufacturing & Position

TABLE 2

TES BEAMLINE FE MIRROR 1 SPECIFICATIONS

Mirror system length, between flanges	1260 mm
Length of mirror substrate	800 mm
Orientation	Bounce down
Material	Silicon
Mirror figure	Cylindrical with bender
Beam incidence angle	9.61 mrad
Mirror acceptance (H/V)	2.5 mrad (H) x 0.4 mrad (V)
Mirror system center position	11.0 m from source
Mirror operating limits (max incidence angle *).	6-20 mrad

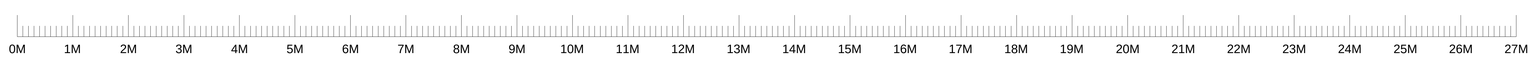
* See NSLS-II Controlled Document: LT-C-ASD-RSI-002-3.

TABLE 3

TES BEAMLINE FE MIRROR 2 SPECIFICATIONS

Mirror system length, between flanges	1256 mm
Length of mirror substrate	1200 mm
Orientation	Bounce up
Material	Silicon
Mirror figure	Flat re-directing
Beam incidence angle	9.61 mrad
Mirror acceptance (H/V)	2.5 mrad (H) x 0.4 mrad (V)
Mirror system center position	12.3 m from source
Mirror operating limits (max incidence angle *).	6-20 mrad

* See NSLS-II Controlled Document: LT-C-ASD-RSI-002-3.



HORIZONTAL
SCALE: X:Z = 1:50

NOTES:

1. **BM-B SOURCE POINT (ORIGIN) IS 3.25mrad DOWNSTREAM OF START OF BM-B.**
2. **ALL MASK APERTURES SHOWN ARE NOMINAL VALUES WITH TOLERANCES SHOWN.**
3. **ALL APERTURES & TOLERANCES ARE ASSUMED TO BE SYMMETRIC ABOUT THE COMPONENT CENTERLINE UNLESS OTHERWISE SHOWN.**

TES, CELL 8-BM-B, SYNCHROTRON RAY TRACING HORIZONTAL

E (SHEET SIZE)	SR-FE-3PW-5001 (DRAWING/GRAPHIT NUMBER)	C (REVISION)
ESH&Q RISK LEVEL	A-1	SHEET 2 OF 7

RELEASED – EFFECTIVE

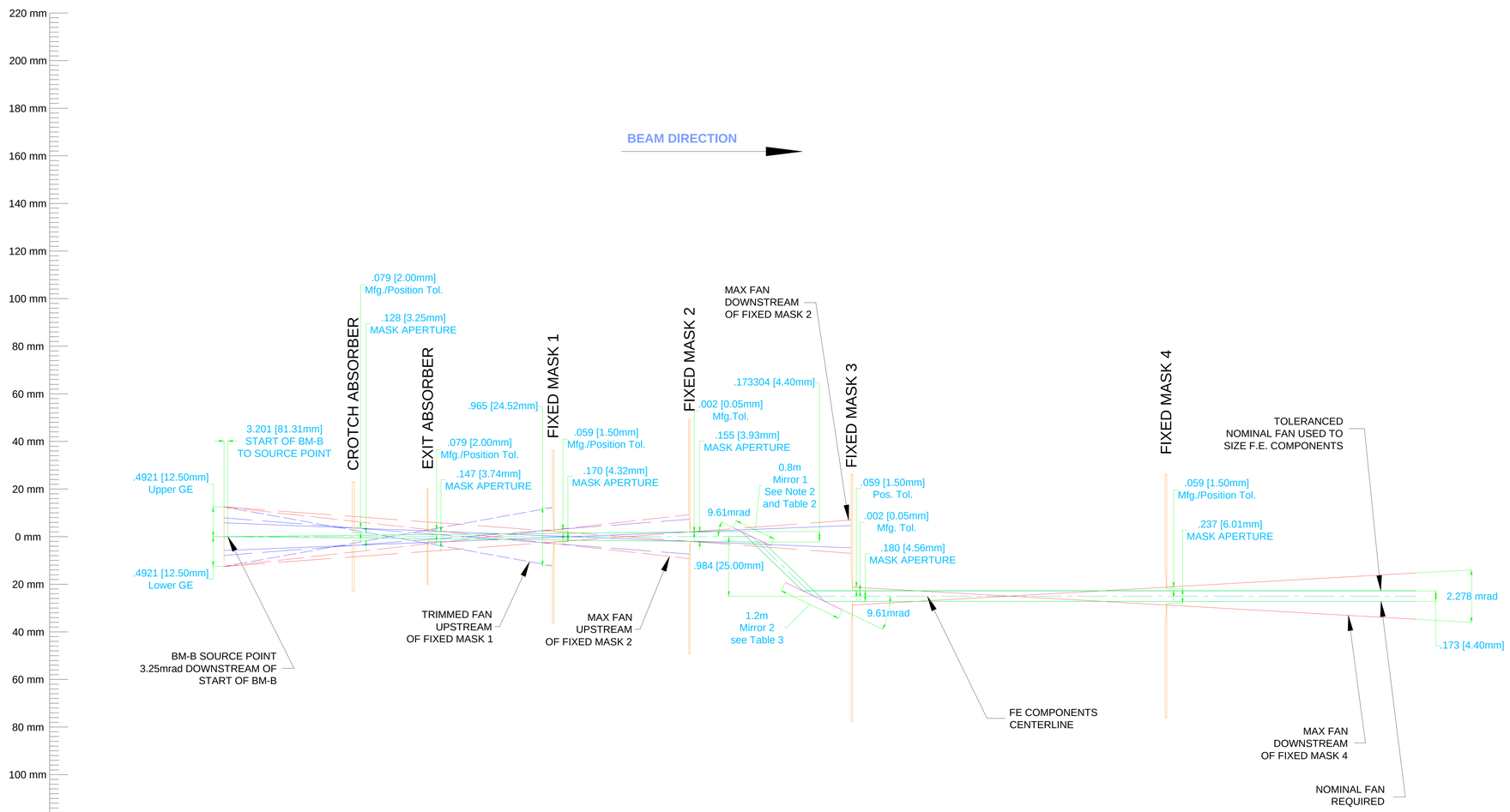


TABLE 2

TES BEAMLINE FE MIRROR 1 SPECIFICATIONS

Mirror system length, between flanges	1260 mm
Length of mirror substrate	800 mm
Orientation	Bounce down
Material	Silicon
Mirror figure	Cylindrical with bender
Beam incidence angle	9.61 mrad
Mirror acceptance (H/V)	2.5 mrad (H) x 0.4 mrad (V)
Mirror system center position	11.0 m from source
Mirror operating limits (max incidence angle *).	6-20 mrad

* See NSLS-II Controlled Document: LT-C-ASD-RSI-002-3.

TABLE 3

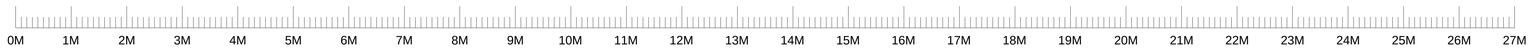
TES BEAMLINE FE MIRROR 2 SPECIFICATIONS

Mirror system length, between flanges	1256 mm
Length of mirror substrate	1200 mm
Orientation	Bounce up
Material	Silicon
Mirror figure	Flat re-directing
Beam incidence angle	9.61 mrad
Mirror acceptance (H/V)	2.5 mrad (H) x 0.4 mrad (V)
Mirror system center position	12.3 m from source
Mirror operating limits (max incidence angle *).	6-20 mrad

* See NSLS-II Controlled Document: LT-C-ASD-RSI-002-3.

TABLE 1 - TES FRONT END RAYTRACE TOLERANCES

	STANDARD TOLERANCE				
	mm		inches		Comments
	+	-	+	-	
Crotch Absorber	2.00	2.00	0.079	0.079	Manufacturing & Position
Exit Absorber	2.00	2.00	0.079	0.079	Manufacturing & Position
FM at LC01 (FM2)	0.05	0.05	0.002	0.002	Manufacturing Only (Beam Defining)
FM3 aperture	0.05	0.05	0.002	0.002	Manufacturing Only
FM3 max fan	3.00	0.00	0.118	0.000	Manufacturing & Position
FM (FM1 & FM4)	1.50	1.50	0.059	0.059	Manufacturing & Position
LCO tube	0.50	0.50	0.020	0.020	Manufacturing & Position
LCO2 tube Horizontal	1.50	1.50	0.059	0.059	Manufacturing & Position (Sized off of Tol. Nominal fan)
LCO2 tube Vertical	0.50	0.50	0.020	0.020	Manufacturing & Position (Sized off of Tol. Nominal fan)
Collimator lead Horizontal	1.50	0.00	0.059	0.000	Manufacturing & Assembly
Collimator lead Vertical	2.50	0.00	0.098	0.000	Manufacturing, Assembly, Heater tape & Heater Tape Clearance
Shadow Shield	3.00	3.00	0.118	0.118	Manufacturing & Position
RCO upstream lead horiz.	7.85	0.00	0.309	0.000	Clearance, Mfg. & Position
RCO upstream lead vert.	8.85	0.00	0.348	0.000	Clearance, Mfg. & Position
RCO downstream lead	3.00	0.00	0.118	0.000	Manufacturing & Position
RCO tube (minimum)	4.00	-	0.157	-	Manufacturing & Position



VERTICAL
SCALE: Y:Z = 1:50

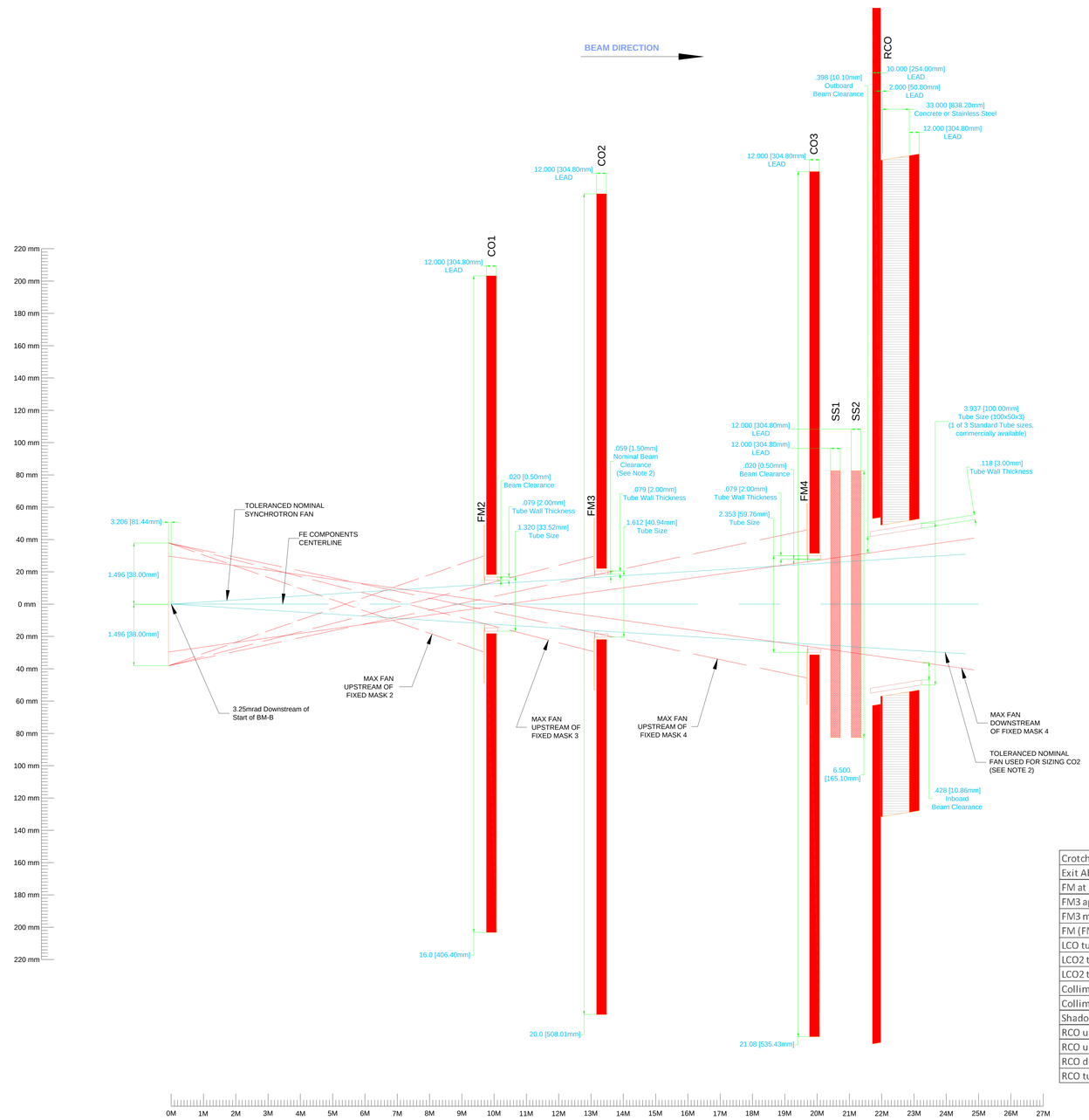
NOTES:

1. **BM-B SOURCE POINT (ORIGIN) IS 3.25mrad DOWNSTREAM OF START OF BM-B.**
2. **VERTICAL SYNCHROTRON NOMINAL FAN IS COLLIMATED BY MIRROR 1.**
3. **ALL MASK APERTURES SHOWN ARE NOMINAL VALUES WITH TOLERANCES SHOWN.**
4. **ALL APERTURES & TOLERANCES ARE ASSUMED TO BE SYMMETRIC ABOUT THE COMPONENT CENTERLINE UNLESS OTHERWISE SHOWN.**

TES, CELL 8-BM-B, SYNCHROTRON RAY TRACING VERTICAL

E (SHEET SIZE)	SR-FE-3PW-5001 (DRAWING/PART NUMBER)	C (REVISION)
ES&HQ RISK LEVEL A-1	SHEET 3 OF 7	

RELEASED – EFFECTIVE



HORIZONTAL
SCALE: X:Z = 1:50

TABLE 1 - TES FRONT END RAYTRACE TOLERANCES

	STANDARD TOLERANCE				
	mm		inches		Comments
	+	-	+	-	
Crotch Absorber	2.00	2.00	0.079	0.079	Manufacturing & Position
Exit Absorber	2.00	2.00	0.079	0.079	Manufacturing & Position
FM at LC01 (FM2)	0.05	0.05	0.002	0.002	Manufacturing Only (Beam Defining)
FM3 aperture	0.05	0.05	0.002	0.002	Manufacturing Only
FM3 max fan	3.00	0.00	0.118	0.000	Manufacturing & Position
FM (FM1 & FM4)	1.50	1.50	0.059	0.059	Manufacturing & Position
LCO tube	0.50	0.50	0.020	0.020	Manufacturing & Position
LCO2 tube Horizontal	1.50	1.50	0.059	0.059	Manufacturing & Position (Sized off of Tol. Nominal fan)
LCO2 tube Vertical	0.50	0.50	0.020	0.020	Manufacturing & Position (Sized off of Tol. Nominal fan)
Collimator lead Horizontal	1.50	0.00	0.059	0.000	Manufacturing & Assembly
Collimator lead Vertical	2.50	0.00	0.098	0.000	Manufacturing, Assembly, Heater tape & Heater Tape Clearance
Shadow Shield	3.00	3.00	0.118	0.118	Manufacturing & Position
RCO upstream lead horiz.	7.85	0.00	0.309	0.000	Clearance, Mfg. & Position
RCO upstream lead vert.	8.85	0.00	0.348	0.000	Clearance, Mfg. & Position
RCO downstream lead	3.00	0.00	0.118	0.000	Manufacturing & Position
RCO tube (minimum)	4.00	-	0.157	-	Manufacturing & Position

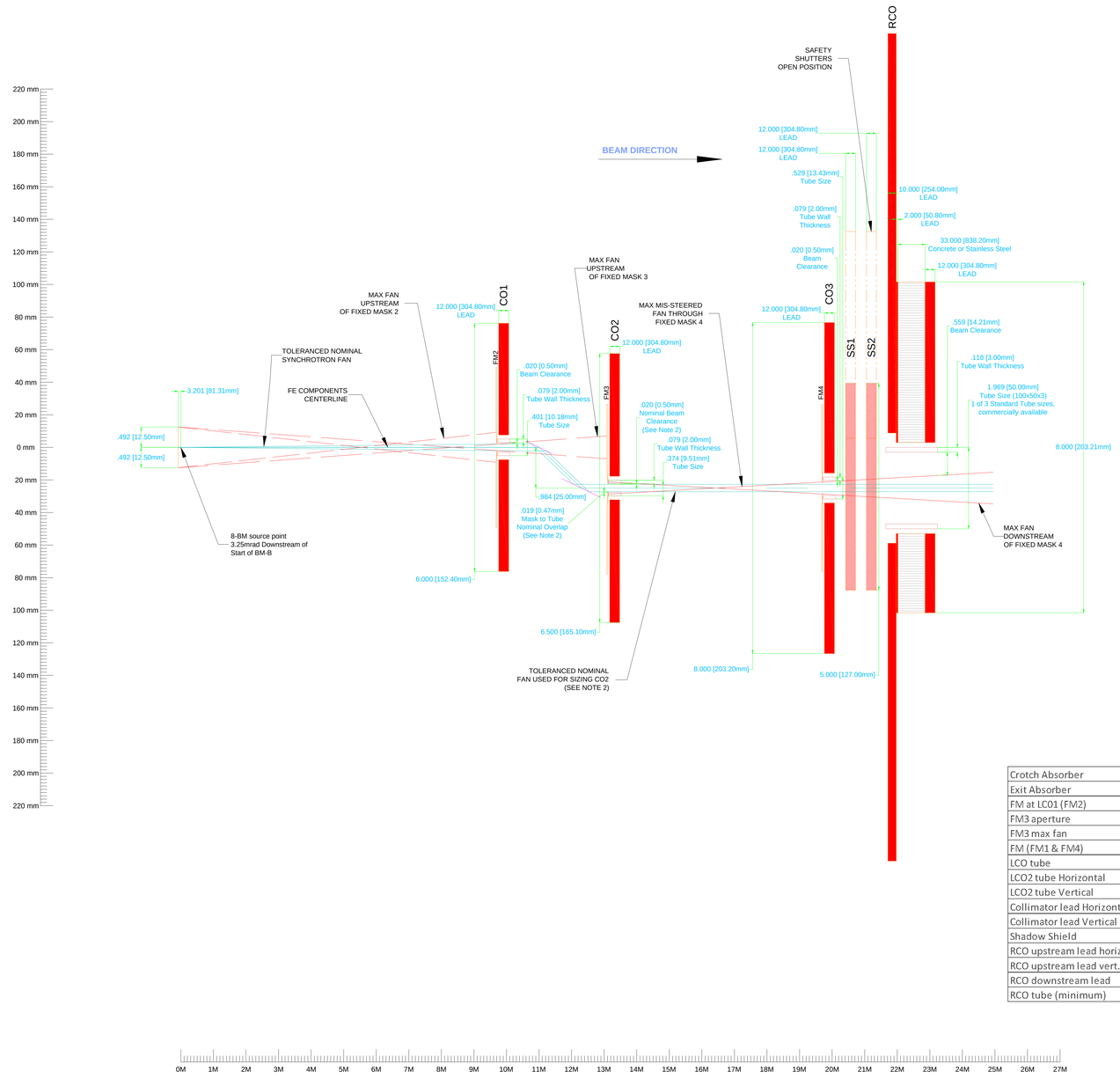
NOTES:

1. **BREMSSTRAHLUNG SOURCE POINT (ORIGIN) IS 3.25 mrad DOWNSTREAM OF START OF BM-B.**
2. **THE MAX MIS-STEERED SYNCHROTRON FAN ORIGINATING AT FM3 IS DRAWN INCLUDING 1.5mm OF POSITIONAL TOLERANCE ON EACH SIDE HOWEVER THE APERTURE FOR FM3 IS SIZED WITHOUT THIS TOLERANCE TO PROTECT THE COLLIMATOR TUBE. THE CO2 TUBE IS SIZED OFF OF THE TOLERANCED NOMINAL FAN AND CALCULATIONS WILL SHOW THAT EVEN IF THE COLLIMATOR TUBE IS STRUCK BY SYNCHROTRON BEAM THE TEMPERATURE RISE WILL BE MINIMAL.**
3. **ALL APERTURES & TOLERANCES ARE ASSUMED TO BE SYMMETRIC ABOUT THE COMPONENT CENTERLINE UNLESS OTHERWISE SHOWN.**

TES, CELL 8-BM-B, MAX SYNCHROTRON COLLIMATOR LAYOUT HORIZONTAL

E	SR-FE-3PW-5001	C
SHEET SIZE	DRAWING/PART NUMBER	REVISION
ES H&Q RISK LEVEL A-1	SHEET 4 OF 7	

RELEASED – EFFECTIVE



VERTICAL
SCALE: X:Z = 1:50

TABLE 1 - TES FRONT END RAYTRACE TOLERANCES

	STANDARD TOLERANCE				
	mm		inches		Comments
	+	-	+	-	
Crotch Absorber	2.00	2.00	0.079	0.079	Manufacturing & Position
Exit Absorber	2.00	2.00	0.079	0.079	Manufacturing & Position
FM at LC01 (FM2)	0.05	0.05	0.002	0.002	Manufacturing Only (Beam Defining)
FM3 aperture	0.05	0.05	0.002	0.002	Manufacturing Only
FM3 max fan	3.00	0.00	0.118	0.000	Manufacturing & Position
FM (FM1 & FM4)	1.50	1.50	0.059	0.059	Manufacturing & Position
LCO tube	0.50	0.50	0.020	0.020	Manufacturing & Position
LCO2 tube Horizontal	1.50	1.50	0.059	0.059	Manufacturing & Position (Sized off of Tol. Nominal fan)
LCO2 tube Vertical	0.50	0.50	0.020	0.020	Manufacturing & Position (Sized off of Tol. Nominal fan)
Collimator lead Horizontal	1.50	0.00	0.059	0.000	Manufacturing & Assembly
Collimator lead Vertical	2.50	0.00	0.098	0.000	Manufacturing, Assembly, Heater tape & Heater Tape Clearance
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RCO upstream lead vert.	8.85	0.00	0.348	0.000	Clearance, Mfg. & Position
RCO downstream lead	3.00	0.00	0.118	0.000	Manufacturing & Position
RCO tube (minimum)	4.00	-	0.157	-	Manufacturing & Position

NOTE:

1. **BREMSSTRAHLUNG SOURCE POINT (ORIGIN) IS 3.25 mrad (81.31mm) DOWNSTREAM OF START OF BM-B.**
2. **THE MAX MIS-STEERED SYNCHROTRON FAN ORIGINATING AT FM3 IS DRAWN INCLUDING 1.5mm OF POSITIONAL TOLERANCE ON EACH SIDE HOWEVER THE APERTURE FOR FM3 IS SIZED WITHOUT THIS TOLERANCE TO PROTECT THE COLLIMATOR TUBE. THE CO2 TUBE IS SIZED OFF OF THE TOLERANCED NOMINAL FAN AND CALCULATIONS WILL SHOW THAT EVEN IF THE COLLIMATOR TUBE IS STRUCK BY SYNCHROTRON BEAM THE TEMPERATURE RISE WILL BE MINIMAL.**
3. **ALL APERTURES & TOLERANCES ARE ASSUMED TO BE SYMMETRIC ABOUT THE COMPONENT CENTERLINE UNLESS OTHERWISE SHOWN.**

TES, CELL 8-BM-B, MAX SYNCHROTRON COLLIMATOR LAYOUT VERTICAL

E (SHEET SIZE)	SR-FE-3PW-5001 (DRAWING/PART NUMBER)	C (REVISION)
ESH&Q RISK LEVEL A-1	SHEET 5 OF 7	

RELEASED – EFFECTIVE